US Army Engineer
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Project Summary

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Levee Condition Assessment

Purpose: Summarize development of levee condition assessment through integration of airborne and high-resolution ground surface geophysics, geologic studies, and development of an enterprise Geographic Information System (eGIS).

Fig. 1. Airborne EM magnetic survey

The primary objective of this project is to rapidly assess the condition of levees using helicopter-borne electromagnetic (EM) and magnetic sensors, digital video, and LiDAR. Levees can be investigated rapidly by airborne reconnaissance, followed by ground surface geophysical surveys in areas where anomalous conditions have been identified. Conductivities of the materials comprising levees are measured by the respective EM techniques, and are related to physical factors such as material-type and moisture content. Using this approach, LiDAR provides elevation data of the levee surface, accurate to within a few centimeters, followed by a variable frequency EM survey that will penetrate into the body of the levee and its foundation to depths of 30 or more meters. By assessing levee conditions during the dry season, a baseline can be established and repairs made to the levee before flooding occurs.

Proof-of-principle testing was performed along 270 miles of levees located in the lower Rio Grande Valley. One helicopter pass was sufficient to acquire LiDAR data, while three passes, one along each levee toe and one along the levee centerline, were used for EM and magnetic data acquisition (Fig. 1). These data were gridded and displayed by color-coded conductivities in both plan and profile views. Levees were then segmented by conductivity, and a ten-point condition assessment criterion was applied for each segment. Factors included in the assessment were past performance, construction records, soil data, a geologic study to identify abandoned river channels, and locations of borrow pits. Anomalous conductivity areas were investigated by high-resolution ground surface geophysics and by additional borings using an instrumented cone penetrometer. Analyses of these data were facilitated by an eGIS, developed for this study (Fig. 2).

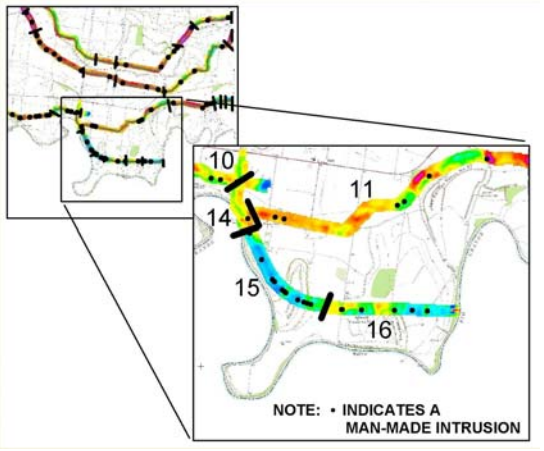

Fig. 2. Example of GIS layers (topo, levees, conductivities, segments, and man-made intrusions)

For more information regarding remote levee condition assessment and data management, e-mail Mr. Joseph B. Dunbar, (CEERD-GS-G), ERDC Geotechnical and Structures Laboratory, at Joseph.B.Dunbar@erdc.usace.army.mil or phone 601-634-3315.